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Some Contagious Diseases of Poultry.*

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The magnitude of the poultry industry has not been realised by veterinary surgeons in this country. Poultry practice is occasionally referred to as deserving our attention, but no serious attempt has been made to undertake such work. We have in the British Isles to-day an industry the annual value of which probably exceeds fifty million pounds, or more than twice that of the wheat crop—one which has increased its production one thousand per cent. in thirty years, and is still advancing. But it is not progressing as rapidly and as economically as the ability and energy of the farmers deserve. One obstacle to progress is the heavy loss from disease, to which fowls, of all domesticated animals, are the most susceptible. I submit that measures for the control and eradication of diseases must come from those who are trained in such work. And who has a more thorough training in the great campaign against animal diseases than the veterinary surgeon? Our opportunity is great, and our duty is obvious. If we allow the work to pass into the hands of unqualified persons, as is happening daily, we fail in our duty; and the failure is not only moral but financial. Those of us who have prepared ourselves for the work must agree that the demands for expert advice are great, and that poultry farmers willingly pay for such service. But we must have knowledge of the special diseases which affect birds, and of the general principles of aviculture. I propose this afternoon to refer to diseases which I regard as of the most economic importance in this country. Lantern slides, museum specimens, and photographs will be used to support my descriptions, and, as I am specially anxious that you should study them, I have limited the length of this paper to give you time to do so. Fowl cholera and fowl plague will not be noticed, as they do not, in my opinion, cause serious loss in Great Britain. The latter disease is of interest, however, as the first recorded outbreak in an English-speaking country was discovered last year by myself. The virus is a filter-passer, and attempts are now being made to cultivate it. It is specially suitable for such work, owing to the low cost of the susceptible animal, the small amount of the lethal dose, and the short and fatal course of the disease.

BACILLARY WHITE DIARRHŒA.

Bacillary white diarrhoea is the disease of most economic importance in this country. It is not possible to estimate the losses caused amongst chicks, but I have experienced several outbreaks where the number of deaths has exceeded ten thousand. The disease runs an acute course in chicks and a chronic course in adult birds. Exceptionally, adults may succumb to an acute attack.

The causal organism of the disease is *Bacillus pullorum*, a member of the Coli-typhosus group. Chickens may be infected in a variety of ways, but the commonest source is infected eggs. Chickens which survive an attack may harbour the causal organism, especially in the ovary, and lay occasional infected eggs. Chickens hatched from such eggs are themselves affected, and are capable of infecting other chickens with which they have immediate or mediate contact. Chickens are most susceptible to infection during the first forty-eight hours of life, and after a week are comparatively immune to acute infection. The disease is commonly introduced by the purchase of day-old chicks and adult "carriers." Clear or infertile eggs are often cooked and fed to chicks. As the former are usually not removed until at least the seventh day of incubation, it is possible for them to contain a rich culture of *B. pullorum*. Unless subjected to a prolonged, high temperature, the organisms contained in the yolk may survive and the eggs be infective. Even with thorough cooking it is doubtful if the potent toxin liberated by *B. pullorum* is destroyed. Contaminated incubators and brooders are other sources of infection. The cycle of infection may be summarised as follows: The carrier hen lays an infected egg from which hatches an affected chick, which survives to become a carrier hen. Cockerels may also act as carriers and infect eggs during copulation. It is probable that an adult can infect chicks by direct contact, and *vice versa*. Infection may pass from adult to adult.

When the disease appears amongst chicks from 10 to 90 per cent. succumb; 70 per cent. may be accepted as average loss. The symptoms during life are not characteristic. Affected chicks show drooping wings, ruffled feathers, sleepy appearance, and inappetance, and a tendency to huddle together near the source of heat. A white or yellowish diarrhœa is almost invariably present. The fæces may adhere to the vent feathers, causing what the poultry keeper calls "pasting up." The eyes are closed part of the time, and the chicks remain in the standing position often with a swaying movement. The back looks short and the abdomen is prominent behind. Swelling of the feet and lameness are less important symptoms. Deaths may occur in the

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shell or immediately after hatching, and continue for a month or longer. The incubation period varies from three to fourteen days. A heavy death rate during the first forty-eight hours is usually co-existent with a high percentage of infected eggs, while a slight early mortality, followed by heavy losses during the fourth day and onwards, points to a small percentage of infected eggs and to the infection being post-natal. Chicks which recover are usually stunted and do not make satisfactory growth.

The post-mortem appearances are not typical, and are not to be relied on for certain diagnosis. The liver is often grossly enlarged and has a mottled appearance. Failure to absorb the yolk is a common symptom in this and other diseases. Areas of round-cell infiltration may be found in the heart muscle and necrotic nodules in the lungs.

Diagnosis depends on the isolation of *B. pullorum* from the carcase and its recognition by laboratory methods. The organism is most constantly found n the egg-yolk and liver. A high mortality, commencing soon after the chicks are hatched, and continuing for four or five weeks, should, in the absence of obvious mismanagement or lesions of other diseases, lead one to suspect bacillary white diarrhœa. The disease is to be distinguished from coccidiosis and aspergillosis, which do not attack chicks under a fortnight old. Oocysts of the causal coccidium can be readily detected microscopically in the contents of the cæcum or small intestine. Occasionally I have found coccidiosis to co-exist with bacillary white diarrhœa, and I always make a point of examining chicks aged from two to five weeks for both diseases. In aspergillosis or "brooder pneumonia" lesions are in the respiratory system, and the causal fungus can be demonstrated microscopically. I here wish to give a word of warning against expressing a hurried opinion as to the presence of the disease. The diagnosis of bacillary white diarrhœa is a very serious matter for the poultry farmer, and should be arrived at only after laboratory examination has been carried out. Where chicks are brooded in units as large as a thousand, deaths occur from non-specific causes, and chicks may show symptoms indistinguishable from those of bacillary white diarrhœa. Overheating and improper dieting often produce similar symptoms. No method of curing or preventing the disease by means of drugs has been evolved. Several text-books advise the administration of internal disinfectants, including corrosive sublimate, but I am opposed to their use. I am unaware of any carefully-controlled experiments proving the value of such treatment. On the other hand, I have ample evidence that the use of corrosive sublimate increases the mortality.

Prevention.—The best point to attack the disease is in the adult carrier, which unfortunately shows no obvious symptoms during life, but may show, on post-mortem examination, marked changes in the ovary. The ova are hard, shrunken, and angular. Bacteriological examination of eggs is an unsatisfactory method of detecting fowls that harbour *Bacillus pullorum* in their ovaries, as they lay only occasional infected eggs. Two tests have been employed for the recognition of carriers during life, namely, the agglutination test and the intradermal test. It is said that the blood serum of affected adults will agglutinate *Bacillus pullorum*, and that the test will pick out a large percentage, if not all, of such birds. Birds which pass the agglutination test may be used safely for breeding purposes. While I regard the test as the best available means of detecting carriers, it requires further investigation. The technique and interpretation of the test must be placed on a firmer basis. You all know that in contagious abortion of cattle a positive agglutination test in an animal which has not been vaccinated signifies either present or past infection. We must be sure that when discarding birds which give a positive test we are not including those which have recovered. Flocks which I have tested have yielded from 10 per cent. to 85 per cent. of reactors. In some cases reactors have been used for breeding, and the mortality has been slight. This and other phenomena of variation in losses from the same breeding stock are now being investigated.

The intradermal test is very similar in character to the intradermal tuberculin test, especially as employed to detect tuberculosis in fowls. A concentrated, sterilised broth culture of *B. pullorum* is injected into the wattle. A positive reaction is evidenced by a swelling which persists for twenty-four hours or longer. I have had little experience of the test, but a few experiments which I have carried out suggest that the test is not in agreement with the agglutination test.

Eggs for hatching purposes should be procured from flocks known to be free from the disease.

In cases where the elimination of carriers is impracticable and breeding from valuable birds is desired, the following procedure will minimise the losses. On the 19th or 20th day of incubation the eggs are transferred to trays of pedigree pattern, which are partitioned off into compartments holding six to ten eggs. The chicks are allowed to hatch out in the compartments and retained therein for two or three days. If disease appears in any compartment, the enclosed chicks are destroyed, care being taken to disinfect the hands after handling them. Excess temperature and humidity are to be carefully avoided during the period of detention. Division of the chicks may be maintained in the brooder either by the transfer of the trays or by the use of a similar structure. On the fourth day the chicks may be allowed to run together.

Spread of infection is favoured by having dry food continually before the chicks. An open type of trough is commonly used for the purpose, which allows the food to be contaminated by the droppings. It is advisable, at any rate, where bacillary white diarrhœa is suspected or known to exist, to allow at one time only such amount of food as will be consumed in about twenty minutes, and to remove the food receptacle at the end of that time. The provision of suitable troughs and the frequent renewal of the water supply are indicated. The scratching litter should be reduced in amount, and should be frequently renewed.

While the measures I have referred to will do much to prevent or minimise losses from the disease, the solution of the problem will not be arrived at till poultry farmers desert their increasing practice of breeding from and for birds with high egg records and of rearing chicks in large units. Dairy farmers clamour for 2,000 gallon cows, and are not content with even the very artificial yield of 600-800 gallons, although they must recognise that the constitution is sacrificed to such production, and that susceptibility to disease (e.g. tuberculosis) is increased. And so it is with poultry; stamina is being sacrificed to egg production.

Coccidiosis.

Coccidiosis is one of the great foes of the poultry yard, and is second in importance only to bacillary white diarrhœa as a cause of death among young chicks; fowls, turkeys, grouse, geese, etc., are also susceptible.

The causal organism is a protozoal parasite now known as *Eimeria tenella*, and formerly called *Coccidium tenallium*. The life cycle is somewhat complicated, and resembles that of other Eimeria, all of which reproduce by sexual and asexual processes. The very definite and intimate relation which exists between the parasite and its host will now be considered. The droppings or intestinal contents of birds affected with coccidiosis contain numerous oval, refractile bodies, varying in size from 25 to 35 microns by 15 to 20 microns, and designated oocysts. Soon after these resistant cysts pass from the body, four spores or sporocysts develop in their interior under favourable conditions. Ultimately two vermiform bodies, called sporozoites, develop in each spore. When the oocysts are taken up with the food or drink of their host, they remain unchanged until they reach the duodenum, where, under the action of the pancreatic juice and increased temperature, the walls are softened, allowing release of the sporocysts. The walls of the sporocysts are similarly dissolved and the sporozoites escape. The motile sporozoite bores its way into an epithelial cell, in which it grows steadily, to form a trophozote. The latter divides into from four to twenty daughter parasites, and at this stage is known as a schizont or splitting form. The daughter parasites, merozoites, finally separate and enter new intestinal cells. In a similar manner to the sporozoites, they increase in size, propagate by division, and finally destroy the host cell. This process of miltiplication and destruction of the intestinal cells, which represents the asexual form of development, continues for a longer or shorter period depending on the resistance of the bird, food supply, etc., but there comes a time when some of the trophozoites in the cells give rise not to schizonts or splitting forms, but to sexual cells. Female cells or macrogamete and male cells, or microgametes are formed. Fertilisation takes place, leading to the formation of oocysts and, ultimately, of sporozoites. The total life-cycle probably occupies a week or ten days.

Domesticated and wild birds are susceptible to infection, but possibly the parasite which affects wild birds, such as sparrows, is a different species.

Adults resist an acute attack better than young birds, and may continue to void fæces charged with cysts without showing obvious symptoms. Wild birds may carry the disease mechanically or be themselves infected. Infection may be spread by wind, or through the medium or water and food. Chicks, pheasants, grouse, turkeys and pigeons suffer most, in the order named, from the disease.

When the disease appears amongst chicks aged two to ten weeks, the loss may be 100 per cent. if they are kept under bad conditions. Adult fowls may also succumb in large numbers if exposed to gross infection.

The symptoms closely resemble those seen in bacillary white diarrhœa. The droppings may be semi-fluid or fluid, and of a white or brown colour. They may contain blood and have an offensive odour. Chicks aged up to two months seldom survive an acute attack, and usually die within a few days of the appearance of symptoms. On the other hand, death may be sudden, with little indication that the end is near. The percentage mortality lessens, and the duration of symptoms increases with age. Adults affected with a chronic form of the disease may show general unthriftiness, diarrhœa or emaciation, but no symptoms sufficient to permit of a definite diagnosis.

Lesions of the disease occur chiefly in the intestinal tract, especially in the duodenum and cæcum. The cæca are frequently thickened and the mucous membrane shows marked catarrh, and congestion or hæmorrhages. Liver lesions are not commonly encountered in chicks.

Diganosis depends on the recognition of the causal parasite in the fæces or intestinal contents. Material should be mixed with a drop of water, a cover slip applied, and the wet smear examined with a one-sixth or one-twelfth inch objective. The oocysts of the protozoa can usually be easily recognised. They are not to be confused with worm eggs. The cyst varies in size and appearance. Its contents may completely fill it or occupy only the centre, and be surrounded by a clear zone with a refractile double wall.

The disease is to be distinguished from bacillary white diarrhœa, which affects younger chicks, and from aspergillosis, in which the causal fungus can be demonstrated in the respiratory system.

Prevention.—The precautions regarding food, water, and litter described for bacillary white diarrhœa should be observed. The amount of grain and green food should be limited, especially the latter, which should be cut dry, and from well-drained soil. Houses should be constructed to prevent the entrance of wild birds. Frequent cleaning and disinfection of plant, prevention of overcrowding, and avoidance of wet runs are obvious measures to be adopted. Any birds showing diarrhœa, emaciation or catarrh of the mucous membrane of the head should be isolated; a conjunctional type of coccidiosis has been described. Cremate all dead birds. New arrivals and birds intended for breeding should be isolated and carefully observed before introduction to the general flock, or before being placed on eggs. Artificial incubation is to be preferred. Eggs for hatching should be procured from flocks known to be free from infection; if there is any doubt, plunge the egg into a strong solution of alcohol or creolin, care being taken not to rub them, and thus fill up the pores of the shell.

When coccidiosis appears, intensify the above precautions, especially for healthy stock, the houses of which should be cleaned every second day at least. Litter and droppings should be removed frequently and burnt. The houses in which the disease exists should be placed in rigid quarantine. On no account should the affected or in-contact birds be removed to another house, even if the losses have ceased. Unless the disease is widespread, it is probably best to destroy all survivors and clean and disinfect the house. Earth floors should be dug out deeply and fresh soil mixed with lime brought in. Contaminated runs should be dressed with a minimum of one and a half tons of unslaked lime to the acre, and then ploughed and sown. They should be abandoned for at least a year.

Treatment.—Many drugs have been tried for the cure and prevention of coccidiosis. The administration of crude catechu in the drinking water and the observation of the precautions already described have, in my experience, given good results. The drug is added to the water in the proportion of two-thirds to one gram per gallon. The solution, which may darken on exposure to air, but which is not impaired by the colour change, is readily consumed by the birds. The treatment should not be continued for more than fourteen days at a time, owing to the astringent nature of the catechu. Constipation may be counteracted by giving magnesium sulphate in the proportion of one-third teaspoonful to each adult fowl.

"Gapes."

Gapes or verminous bronchitis of birds is caused by a nematode named *Syngamus trachealis*. Many species are susceptible, including the fowl, turkey, pigeon, cage birds, and a large number of wild birds. Chicks up to four weeks old are most commonly infested. Adult turkeys harbour the parasite more frequently than adult fowls.

The gapeworm is nearly always found in copulation in the air-passages; the male measures about one-fifth inch long. Being attached to the anterior end of the female, the length of which is about four-fifths of an inch. As many as thirty worms may occur in the trachea.

The symptoms of the disease in young birds are a curious listless gaping of the mouth, a wheezing cough, and frequent stretching forward of the neck in an endeavour to expel the parasites. Frothy saliva and mucus may come from the beak. Dyspnœa, inappetence, emaciation, and general dullness, with ruffling of the feathers, are also seen. Unless they are treated, young birds usually succumb in large numbers. Infested adult birds generally show no obvious symptoms.

Post-mortem examination reveals the presence of the forked worm in the trachea, bronchi, and even in the lungs. The air sacs may also be involved. Inflammatory changes occur in the air passages, more especially at the point of attachment of the worm to the mucous membrane.

The life history of *Syngamus trachealis* is fully known. The female produces eggs which may pass up the trachea and be swallowed by the host, the eggs passing out of the body in the fæces. Eggs and sexually mature females may also be expelled by coughing. The females die and disintegrate, releasing the eggs. Under favourable conditions of moisture, temperature, and in the presence of fresh oxygen, the egg develops an embryo in its interior, and is then capable of infesting a young bird, which ingests it. Earthworms have been regarded by certain workers as disseminators of the disease, but the part they play is certainly mechanical, and not that of an intermediate host. They may ingest eggs and void them in their casts on clean ground, or the earthworms may be eaten by birds and cause infestation. While eggs may survive on soil for more than a year in temperate climates, it is probable that the reservoir of infection is the adult carrier bird, either domesticated or wild. Adult turkeys are commonly infested without apparent symptoms, and there is evidence that wild birds may be similarly affected, but whether by the same species of syngamus is a point requiring further investigation.

Treatment.—Treatment may be applied to individuals or to the brood. The common practice of passing a feather, wire, or horsehair into the trachea cannot be recommended, as the operation is cruel, dangerous, and uncertain in its results. Turpentine and olive oil, carbolic oil, and eucalyptus oil are applied to the feather which is pushed down the trachea and rotated.

Birds may be confined in a box and fumigated with camlin powder, or finely-ground chalk and camphor. Fumes of camphor oil may also be employed. Great care is necessary in fumigating birds, and deaths are not uncommon when carbolic oil is used.

Intracheal injection is probably the best treatment. 1 c.c. of a watery solution of sodium salicylate is injected into the trachea by means of a hypodermic syringe, the needle being directed downwards, and the injection made quickly. A simple method is to introduce the solution by means of a blunt canula, which is passed by the mouth into the larynx.

Prevention.—Observe the precautions previously outlined with regard to watering, cleansing of plant, isolation of affected, and disposal of carcases. Move affected flocks at five-day intervals to fresh ground, but only to land which will not be used for young chicks within a year. Avoid overcrowding at all costs, and keep chicks apart from adult birds, especially turkeys. Place chicks on dry land, or, if that is not possible, rear them on board floors. Lime contaminated runs or water with 1 per cent. sulphuric acid, plough, and sow. If infected land must be used, reserve it for adult fowls, but do not use it for chicks within a year.

Infectious Entero-hepatitis of Turkeys.

This disease of worldwide distribution is the most important disease of turkeys. In English-speaking countries it has received the unfortunate and misleading name of "*Blackhead.*" The identity of the

causal organism of the disease is disputed. It has been described as an amœba, a coccidium, and a flagellate by various workers. The view that Histomonas, a motile protozoan, is the causal agent is the most acceptable.

Young turkeys aged two to three months are most susceptible, although most turkeys pass through an attack at some period of their life. Chickens are not commonly affected, but there is evidence that they may act as carriers.

Contaminated ground is the chief source of infection, and may remain a danger for a period extending to two years. Definite information is lacking regarding the part played by carrier birds, but there is little doubt that adult turkeys and chickens are reservoirs of infection, and that their droppings are a source of danger to turkey poults, which ingest them.

The incubation period of the disease is about one month in young turkeys, and death may result within a few days of the appearance of symptoms. Older birds may die within two months or, more commonly, survive. Complete recovery of the latter may ensue or they may suffer from a chronic form of the disease, and succumb to a relapse in the following year, especially in the winter and spring. The death rate may approach 100 per cent. in poults and be 10 per cent. in adults. Affected poults are drowsy, are unable to keep up with the rest of the flock, have little appetite, and show drooping wings, and lustreless, ruffled feathers. Diarrhœa of a yellowish-brown colour is a common symptom. Older birds may also show diarhœa, and have an unthrifty and emaciated appearance.

The post-mortem lesions of the disease are confined to the intestine and liver. One or both cæca may show pathological changes closely simulating those seen in coccidiosis. The cæca are distended, with a necrotic exudate, and may exhibit several ulcerated areas. Occasionally perforation of the intestine may be observed, with secondary peritonitis.

The liver lesions, which occur in all but very acute cases, are characteristic. Their appearance is well shown in the museum specimen and lantern slide submitted. You will note that the areas of degeneration are round, and vary in size to an inch in diameter. They are usually multiple, and of a yellow-green colour, with an area of congestion around them. The fact that they are not elevated above the surface of the liver is an important point.

Diagnosis.—The discovery of cæcal and liver lesions, as previously described, is sufficient evidence of the disease. Possible infection with tubercle bacilli may be negatived by the usual methods.

Treatment.—The administration of crude catechu, as previously described for coccidiosis, is probably the best curative treatment. Emetin hydrochloride and ipecæ have also given good results.

Prevention.—The prevention of the disease is difficult owing to the wide area over which turkeys range. Birds should be obtained from flocks known to be healthy, and not to have had contact with diseased birds. New purchases should be isolated for at least a month. Where losses have occurred over a period of years, the disposal of the entire stock for table purposes is indicated. Turkey farming on the same land should be abandoned for at least two years. The rearing of poults in confined areas and in houses which can be disinfected has yielded good results. The usual methods of dressing land, precautions regarding feeding and watering are indicated. Young turkeys should not be allowed to run with older birds. Disinfection of eggs, as previously advised for bacillary white diarrhœa, is helpful. Turkey eggs should be incubated artificially or under fowls, but on no account under turkeys.

Avian Diphtheria and Bird Pox.

The disease included under these terms is the commonest malady of adult fowls in this country. Most large farms and laying tests have experienced outbreaks, and it can be observed daily in poultry markets. The disease is known under a number of names, including roup, canker, diphtheria, contagious catarrh, etc.

I shall not discuss here the conclusions arrived at by a large number of workers regarding the etiology and pathology of the disease. It has been the subject of more investigation than any other disease of birds, leading to a mass of contradictory and confusing results. The view I place before you is that the conditions known to the poultry farmer as roup, diphtheria and pox are one and the same disease, caused by a filter passing, tenacious virus.

Fowls, turkeys, pigeons and other birds, both domesticated and wild, of all ages, are naturally susceptible to infection. The method of infection is not clearly understood, but the virus probably gains access to the body through wounds or by ingestion. Fighting between cockerels is held by many farmers to predispose to infection. Artificial infection may be induced by rubbing infective material into the skin or mucous membrane, especially if the parts have been scarified. Intravenous, intramuscular, and subcutaneous inoculations of virus cause typical diphtheritic and pox lesions. The incubation period varies from three to twelve days, or if filtered virus is used, from six to fifteen or twenty-five days.

The mortality varies greatly, depending on the degree of exposure, virulence of the virus, weather conditions, and methods of housing, etc. From 10 to 80 per cent. of the birds may become affected, of which up to 90 per cent. may die. I had an experience of an outbreak last year where 204 birds out of 283 succumbed in spite of non-specific treatment. Losses are heaviest in the autumn and winter.

The disease may run a peracute course, the birds dying without showing any premonitory symptoms, or they may last for a period of a few days or many weeks.

As in several diseases due to filter passing viruses, the clinical manifestations are many. The disease may be evidenced by a pure mucous membrane affection, or by a pure skin disease, or both these tissues may be involved. The first symptoms are usually a discharge from the nostrils and eyes.

Exudate tends to accumulate in these situations, causing plugging of the nasal cavity and bulging of the conjunctival sac. A cheesy mass may form in the infraorbital sinus, resulting in marked swelling and distortion of the part. Distortion may also occur in the nasal region. Later, the mucous membranes of the mouth cavity, throat, and trachea may become involved, and a diphtheritic exudate form over an area of variable extent. The larynx may become plugged with exudate, in which case the bird often dies suddenly from suffocation. Fowls so affected usually make a peculiar noise, open mouth widely, and endeavour to cough out the accumulated exudate. Birds affected with the mucous membrane form of the disease usually breathe through the mouth, and may suffer from what is popularly called "Pip," or drying of the tip of the tongue. Except in very chronic cases such birds are dull, mope, have little appetite, exhibit feverish symptoms, and occasionally diarrhœa. Death may occur from asphyxiation, by absorption of toxin of primary and secondary agents, or by starvation following blindness and inability to feed, or from a combination of these causes. Birds may recover completely or the disease may assume a chronic form. During an outbreak many birds may show only pox lesions or the skin form of the disease. The death rate amongst birds so affected is usually small.

Lesions of bird pox or contagious epithelioma occur most commonly on unfeathered portions of the body, especially on the head, but may be found on any other part of the skin. Single nodules vary in diameter up to half an inch, but have a tendency to coalesce into large masses. They attain the maximum size in from four to six days, and can be easily removed within a week or so of their appearance. When they first appear they are yellow in colour, with a comparatively smooth surface, but later become brown or black and crinkled. The nodules result from a proliferation and enlargement of the epithelial cells of the part. The microscopical appearance closely resembles that of an epithelioma, with the addition that cell inclusion, resembling Negri bodies, are seen in the tumour cells. The diphtheritic lesions present no special characters, and may contain a large number of secondary organisms. Diagnosis depends on clinical symptoms. The presence of diphtheritic lesions in the mouth cavity and pox nodules on the combs and wattles is sufficient to establish a diagnosis. False membranes may form in the mouth in other diseases, but the frequency of such an occurrence is not sufficient to deserve routine consideration.

Treatment.—When only a few birds are affected and they are not of special value, they should be killed and cremated. If curative treatment is desired, it should be individual and thorough. Local treatment of the nasal cavity and eyes with antiseptics is indicated. The most convenient method is to immerse the head for thirty seconds in the antiseptic solution, care bing taken to have the mouth open and directed upwards. Swellings in the infraorbital region should be freely opened. Exudate should not be allowed to accumulate in the eye cavity or to gum the lids together. Two drops of a 20 per cent. solution of Argysol may be dropped into the eye twice daily. Diphtheritic lesions in the mouth cavity may be treated with the same solution, or with tincture of iodine. The larynx should be carefully examined. Examination of the part and removal of accumulated exudate is facilitated by forward and upward pressure on the organ from the outside. The round end of a hairpin is commonly and successfully used by poultry men to remove exudate. Hand feeding of severe eye cases is indicated. The treatment of pox nodules is, in my opinion, unnecessary.

Prevention.—The introduction of infection should be guarded against by the isolation of all new purchases and of birds returned from laying tests and shows for at least a month. Mediate or immediate contact with affected birds is, of course, to be avoided. Farmers should not be advised to treat sick birds unless they can observe rigid precautions against the spread of infection by attendants. The preventive measures referred to previously regarding feeding, watering, and litter, immediate recognition and the isolation of sick birds, frequent disinfection and cleansing of plants and disposal of carcases, are indicated. There is no easy way of preventing this disease. Daily examination of *each* bird in the flock, either when they are handled in trapnesting or on the roost, is easily the best means of checking the disease. Advise division of flocks into the smallest workable units. If dry mash hoppers are in use, advise against them, as they are a very fruitful source of infection in this and other contagious diseases. During an outbreak grain should not be fed in the litter; the loss of exercise will be amply recompensed by a lessened mortality.

Many vaccines and serums for the cure and prevention of this disease are on the market. The majority of the vaccines are composed of secondary organisms. A sterilised emulsion of pox nodules and diphtheritic lesions has been used as an immunising agent on a large scale in America, but its practical value has not, in my opinion, been proved. It is reported to lose its immunising power after two weeks' storage. More recently claims have been made regarding a vaccine composed of attenuated virus, but no information is given regarding the method of attenuation or to what degree the virus has been fixed. In the absence of such information, and, as an attenuated virus vaccine may give rise to serious outbreaks, I am not at present prepared to recommend its use.

My intention was to describe in detail two other diseases, namely, tuberculosis and fowl typhoid, but their importance does not justify adding lengthy descriptions to an already long paper. I shall content myself with summaries which, with the help of lantern slides and specimens, may, with your approval, answer the purpose.

Tuberculosis.

Tuberculosis, commonly called liver disease or spotted liver by poultry men, is closely related to

the same disease in mammals, and is caused by the avian type of tubercle bacillus. The disease is widespread, and attacks adult fowls most frequently. A large number of domestic and wild species are susceptible. Pigs may be naturally infected with the avian type of bacillus, and there is evidence that cage birds can contract the disease from mammals.

The chief symptoms are anæmia and emaciation, with general unthriftiness. The appetite is usually well maintained. Lameness is a common symptom, and is often regarded as rheumatism by laymen. Young birds rarely show symptoms. The occurrence of deaths at intervals is a characteristic feature of the disease. The mortality may reach 50 per cent. annually under adverse conditions. The lesions resemble the mammalian type, but are most commonly located in the liver, spleen, and intestines. Lymph glands are only occasionally involved. All the internal organs may be attacked. Skin and bone lesions are not uncommon.

Diagnosis depends on the demonstration of the tubercle bacillus in the lesions by the usual methods. The disease may be detected during life by the intradermal tuberculin test applied in the manner described for the similar test for bacillary white diarrhœa. Avian tuberculin, diluted 50 per cent., is used. The subcutaneous test is not of value. The test can be applied economically only to valuable flocks.

Prevention consists in isolation of new purchases, improving sanitary conditions, and keeping young birds apart from adults. The usual method of disinfecting houses, provision of clean land, and treatment of contaminated runs are indicated. When the value of the birds does not justify the expense of tuberculin testing, the best policy is to market the flock for table purposes. Birds showing clinical symptoms should be cremated.

Fowl Typhoid.

Fowl typhoid is endemic in various parts of Wales, where it has often been described as fowl cholera. It is a septicæmic disease caused by bacillus gallinarum, an organism very closely related to bacillus pullorum. Fowls, pigeons, and guinea-fowls are naturally attacked. The symptoms resemble those of other acute septicæmic diseases. A yellow-greenish diarrhœa is the first and principal symptom. Food is refused, but an excessive thirst is exhibited. The disease usually runs an acute and fatal course in one to five days. Adults are more susceptible than chicks. Fever and blanching of the combs, wattles, and mucous membranes commonly occur.

The post-mortem lesions are not characteristic. The liver and spleen are usually enlarged. The liver may show necrotic foci. The blood undergoes marked changes, the chief of which is an increase in the polymorphonuclear leucocytes. The intestine may be pale in colour, congested or hæmorrhagic. Diagnosis depends on the isolation of *B. gallinarum* from the carcase and its identification by laboratory methods.

The usual preventive measures applicable to contagious diseases are indicated. Several vaccines are on the market which are claimed to give good results.

In conclusion, I wish to make clear that I have drawn information freely from a number of sources which have not been acknowledged, in order to economise time. I now ask you to view the museum specimens.

Discussion.

The President, Mr. F. G. Edwards, said that all present had listened to a very interesting paper, and he now called for a good discussion.

Mr. Noel-Pillers was afraid he could not open the discussion in a manner such as the paper deserved, and he observed that it was not long ago that an eminent veterinary surgeon stated that if his son wrote a paper on poultry diseases, he would have a gun pointed at him. He thought the Veterinary Profession had gone a long way since then. What the veterinary surgeon really wanted was somebody upon whom he could rely to whom to send specimens, somebody who could give advice, and if Captain Rice would respond, he was sure veterinary surgeons and poultry owners would benefit. Another point was what books to read; would Captain Rice let them know? He had very much enjoyed listening to the paper, and, although very often the discussions were light, he hoped that Captain Rice would not get the impression that the members were not interested in his paper.

Mr. Whitehead cited the case of a medical officer dealing with canker in pigeons. Treatment was tried in various forms, but not the treatment that he had heard that day; nevertheless, the canker was not cured. He wished to thank Captain Rice very much for coming that afternoon.

Colonel Brittlebank wished to thank Captain Rice for coming amongst them that afternoon and delivering such an interesting and comprehensive address. It was very gratifying to those of the profession to realise that the veterinary branch of the Ministry of Agriculture had interested themselves in the diseases of poultry in the way they had. The industry was a very large one and of capital value to the nation, and there could be little doubt that the research that was now being carried on would be of immense economic importance. He regretted that, although he had been a practical poultry keeper for many years, he knew very little about some of the conditions described by Captain Rice. Some of the more obvious conditions, such as tuberculosis he was, of course, familiar with, and they were readily recognisable on *post-mortem*. But he had to confess that on many occasions he had carried out *post-mortems* with great care, but had been little wiser at the end in his attempts to illustrate the cause of death: that was plainly due to his own regretful ignorance. He would readily admit that he had profited greatly by what he had learnt that afternoon. Veterinary surgeons in practice would be called on much more frequently in future than in the past by poultry keepers on a large scale, and it certainly behoved the members of the profession to lose no

more time in making themselves acquainted with all the diseases of birds, for so circumscribed was the area becoming from which many of them derived their incomes, they would be foolish to lose any opportunity for opening new fields.

Mr. EDWARDS thanked Captain Rice, and stated that a turkey was once sent to him which had been dead for only a few hours, but smelt as if it had been dead for weeks. He thought he told the owner to put Condy's Fluid in the drinking water of the other fowls.

Captain RICE, in reply, said that Lancashire was a very big poultry area, and therefore veterinary surgeons should have a good knowledge on this subject. He noted Mr. Pillers' request for advice on diagnosis, also on the need for a laboratory for poultry diseases. He would be pleased to help in every way he could, but at the present time he was "snowed under" with specimens. He had had about 900 specimens sent in that year, so they would realise the work entailed; he was afraid he would be unable to undertake any more work at the present time. Unfortunately, he did not know of any other place to which specimens could be sent, but he understood there would be a laboratory appointed to deal with this work in the near future. Last year he visited a large number of poultry farms, and one farmer asked the local veterinary surgeon to examine a number of fowls. The veterinary surgeon said his fee would be two guineas, and Captain Rice said he thought that was an indication that he did not want to undertake the work. With regard to canker of pigeons, that was a similar disease to diphtheria in fowls. In his desire to economise time he had not written about guinea-fowl typhoid. Another point he wished to emphasise was that he was not prepared to give a diagnosis without the use of the laboratory; the naked-eye appearance helping one very little. He noted that the President had advised an owner to put a disinfectant in the drinking water, and drew the President's attention to a museum specimen, asking him if the condition of the turkey was, as far as he could remember, similar to the specimen. The President replied that he thought it was. Captain Rice said he had anticipated the query on books; he had, therefore, brought a book along, which he could recommend, entitled *Diseases of Domesticated Birds*, by Ward and Callagher.

MR. H. L. ROBERTS' CANDIDATURE.

An invitation has been extended to Mr. Horace L. Roberts, F.R.C.V.S., of Ipswich, to stand as Labour candidate for the Bedford Division at the next Parliamentary election. The prospective candidate is the fourth son of the late Sir Thomas Lee-Roberts, and was educated at Bedford Modern School. Several of the brothers played Rugby football, and Mr. Horace Roberts was a prominent member of the Royal Veterinary College XV. For some years he has been actively connected with the Independent Labour Party. At the recent election he worked for Mr. Jackson in the Ipswich constituency, addressing a great many meetings, and the Labour candidate succeeded in turning a big Conservative majority into a victory for Labour.—*The Bedfordshire Standard.*

Animal Diseases Research.*

By S. H. GAIGER, F.R.C.V.S., Chief Investigator, Animal Diseases Research Association.

Research into animal diseases has been going on from time immemorial, but it is only in comparatively recent years that such studies could be termed scientific.

It is just over four years ago that a conference was held at the offices of the Board of Agriculture for Scotland to consider the steps to be taken for the institution in Scotland of a permanent scheme of research with assistance from Government funds. There were present representatives of the Board of Agriculture, the Highland and Agricultural Society, the Chamber of Agriculture, the National Farmers' Union, and the Veterinary and Agricultural Colleges.

I think I am right in saying that the calling of this conference was the direct result of the persistent efforts of Mr. Peter Reid who, year in and year out, never ceased to advocate some such move, and I have in my possession a copy of Mr. Reid's own original proposals which bear a strong resemblance to the constitution of the now-established Animal Diseases Research Association.

This conference in Edinburgh, in 1919, was really the commencement of the present A.D.R.A. There were inevitable delays at first in getting the scheme going and obtaining Treasury approval of it, and it was not till April, 1922, that the research work of the Association was commenced. It is, however, scarcely correct to say "commenced," because the Association took over as an already going concern the research organisation of the Glasgow Veterinary College. That there was an existing organisation to take over was also due to the efforts of Mr. Reid, who, as a Governor of the Glasgow Veterinary College, was instrumental in convincing first his fellow Governors, and through them the Government of the need for instituting research into animal diseases, efforts which led to the College receiving a preliminary grant-in-aid for this purpose in 1917.

The work, begun in 1917, has expanded enormously, and the laboratory to-day is in close touch with agriculturists and veterinarians all over Scotland and the north of England. It would surprise many to see the correspondence files which contain letters from practically every county in Scotland, England, and Wales, from many counties in Ireland, and from most parts of the British Empire and foreign countries. Research problems can only be properly tackled when the research workers have a wide connection amongst practical agriculturists and veterinarians, and I am glad to say that connection has now been set up and is continually being extended.

The Association consists of members paying an annual or life membership subscription. The members elect annually the Directors of the Association, who elect their President and Vice-President. The Ordinary Directors represent the different counties

* Lantern Lecture to the Agricultural Discussion Society of the West of Scotland, December 5th, 1923.

of Scotland, and besides these there are four co-opted Directors and ten Special Directors, the latter being elected after nomination by any Government Department or other public body contributing to the funds of the Association.

The scientific work is carried out by the scientific staff, working upon a general scheme of research approved by the Scientific Advisory Committee. This Committee has a majority of members qualified in research.

At the conference in 1919, the chairman remarked that "the proposed investigations had in view the eradication of diseases for the benefit of the agricultural community," and in the statement sent by the Association to the Treasury in 1921, requesting a grant-in-aid, it was stated that "to obtain beneficial results it will be necessary to continue the researches until the actual causes of disease affecting live stock are ascertained, and then to take up the question of preventive and curative measures." From this it will be seen that the work is not merely academic research, but research prosecuted with the object of obtaining useful results for the agricultural community.

This may be:—

(1) by the use in the field of some laboratory product as a preventative;

(2) by the use of a laboratory product as a diagnostic agent in order to lead to the detection of animals acting as carriers of infection;

(3) by the discovery of some simple practical method for the avoidance of infection, which can be put into operation by the owner of stock himself, under professional advice.

The constant objective of the work is to discover the means by which animal diseases can be controlled, and wherever possible eradicated. It frequently happens that in order to reach such a destination a very long and devious route has to be traversed.

Have we any justification for the belief that research gives results proportionate to the money expended upon it? There can be no question that it has done so in the past and will continue to do so in the future. Let us glance for a moment at the past.

What research has been doing for industry in the last fifty years, it has also been doing for medicine, both human and animal. Round about great industrial cities the inhabitants are well aware to what research in industry has led. In human and animal medicine one does not at first glance get such easy ocular demonstration of the utility of research, but the results *are* there and can be pointed out in every direction quite easily.

What hope has been brought to many sufferers by the recent discovery of insulin for the cure of diabetes. What a small part typhoid played in the late war compared to previous wars. One no longer thinks with dread of such diseases as hydrophobia, diphtheria, and small-pox. Wide tracts of the world's surface have been rendered safe from yellow fever and malaria.

In veterinary medicine we have no less wonderful illustrations. The discovery of mallein in 1894 as a diagnostic agent for glanders in equines has all but led to the eradication of that terrible disease from Britain. The absence of this disease from equines means its absence from human beings, though at one time, cases in man were common enough. In the South African war the disease took a heavy toll, but in the late war mallein robbed glanders of all its terrors. This month a Canadian veterinary surgeon has published an account of a serum which he has made, and which has given astonishing results in the treatment of three cases of human glanders, and holds out hope where previously there was little or none for human beings who become infected, in countries where the disease is still common.

Practically all our methods of combatting animal contagious diseases are based upon the knowledge gained from scientific research. We know, for example, that the bacillus of anthrax only thrives in the presence of oxygen, and that, given a free oxygen supply, it has the power of forming itself into the so-called spore, in which state it is very difficult to destroy, but is yet just as capable of setting up anthrax if it gets into the animal body. It is this knowledge which has led to the framing of the law that anthrax carcases must not be opened or cut in any fashion. The anthrax bacillus cannot form the resistant spores in the unopened carcase, so it is buried unopened six feet below the surface of the ground, where the temperature requirements are unsuited to the growth of the anthrax bacillus, but where putrefaction can go on in the carcase and kill out the anthrax infection. Without this knowledge, anthrax would cause serious losses in this country, whereas now the disease is almost confined to cases arising from infected feeding-stuffs coming from countries where anthrax is not controlled in the way it is here.

This country is now free from rinderpest, bovine pleuro-pneumonia, rabies, dourine and epizootic lymphangitis, and there is a watchful veterinary service keeping them from again gaining entrance, and ready to apply scientific and practical methods to stamp them out if they should re-appear.

It is safe to say that there is not a single disease in man or animals upon which scientific research has not in the past made at least some impression for good.

And now let me outline in a very general way what the problems are for present and future study in animal diseases research.

It is safe to say that at present if the general public think of animal diseases they think mainly of foot-and-mouth disease. The sight of columns of smoke and their sense of smell serve to remind them and to stimulate interest. It is often said that the policy of slaughter is due to the failure of research to find something better. That is only a half-truth, in the same way that it is only a half-truth to say that the cause has not been discovered. The nature of the causal agent is fairly well known, but the problem is to know how it succeeds in reaching this country

from other infected countries other than in the bodies of infected animals. It is a very remarkable fact that it is very difficult to preserve alive the virus of foot-and-mouth disease outside the living animal body when one tries to do so, and yet the virus seems able to remain alive away from the animal body without man's intervention, and long enough for it to arrive in this country and set the disease going.

Another problem is to find a practicable method of conferring immunity against foot-and-mouth disease upon healthy animals. The only known method of doing this satisfactorily is to convey the disease deliberately from one animal to another. If that could be done without setting up a serious reaction in the healthy animals, the problem would be solved, provided the immunity would last more than a year. Even an attack of foot-and-mouth disease only gives about a year's protection, and cows have been known exceptionally to have two or three attacks in a year. The mortality in foot-and-mouth disease is slightly less than one per cent., but the loss of general condition from foot troubles, and loss of milk supply till next parturition, is so serious that it has been found the cheaper policy to stamp out the disease by slaughter.

In foot-and-mouth disease, in distemper, and in swine fever, we have one great common problem which is to find a method of cultivating the causal virus outside the animal body. When this is possible it is probable that the virus can be modified in its virulence to allow of its use for vaccination.

There is no greater problem in animal diseases in this country than the eradication of bovine tuberculosis. Research in this disease is far in advance of applied practical measures. Science has produced a practical and valuable method of diagnosis, and is waiting for the law of the land to step in and prevent its misuse. Research has shown that the main danger to healthy cattle is from cases of "open" tuberculosis, that is, cases with tubercular lungs, udders and intestines giving off living and virulent bacilli; and here again we are waiting for the law to provide for the elimination of these. It has been shown that the calf from a tubercular mother is born free of tubercle, and that if such calves are reared separately, and on pasteurised milk, they in time constitute a healthy herd, the results being checked by tuberculin testing from time to time.

The scientist is hoping that in time education and enlightenment will bring the farmer to co-operate in getting the herds of the country healthy.

Another great problem is contagious abortion. Much has been done, the cause of the disease and its method of spread are known, but more research is undoubtedly wanted. Much good has resulted from artificial immunisation with living cultures of the bacillus, and the best advice that can be given at present is that the farmer make sure that it is contagious abortion that his cows have, and then practise isolation and inoculation. A simple method of examining the blood tells what animals in the herd are infected. There is much need for a simple and effective diagnosis test such as the veterinary practitioner could use himself. If such could be found, it would be of great utility.

Science has enabled the law to step in to some extent to minimise the spread of this disease by prohibiting the exposure of dangerous animals for sale, or their being sold without declaration, or served or grazed on common land for a period of two months after abortion.

Much more could be done by the farmer if he were educated up to what he ought to do to avoid the spread of this disease.

Sterility is a serious trouble. To some extent it is a physiological problem, but it would appear to be largely a disease problem. Much work has been done upon it in several countries, showing it to be more amenable to prevention than cure, but a great deal of research requires to be done before the several causes are properly understood. Sterility offers a fruitful field for research.

"Bracken poisoning" has been much to the fore this autumn again in cattle, as in former years. Our knowledge of this condition cannot be said to be satisfactory. Is the term "bracken poisoning" anything more than a mere term as "grass disease" is a mere name for numerous fatalities in horses? I do not think that as yet a definite or satisfactory answer can be given. Of late, many have given their view that the disease is the same as hæmorrhagic septicæmia in cattle, which is seen on the northern shores of the Mediterranean and in India. That view is simply guesswork, because the two conditions have little or no resemblance to each other.

Research has shown us the cause of swine erysipelas and an effective method of prevention, but the agriculturist suffers his losses in most cases in ignorance that anything can be done for him. So little has been the demand for the preventive serum and vaccine on the part of the agriculturist, that no laboratory in this country has found it worth while to make the serum, which has to be obtained from the continent when required. The vaccine is simple and inexpensive to make, but can only be used along with the serum. The losses from this disease are quite considerable.

Poultry diseases afford a field of research by themselves. Much has been done, but more remains, and indeed the field for research might almost be described as little touched, when one thinks of the many problems awaiting solution. It is satisfactory to find research workers now specialising in this important branch.

An organised investigation into "grass disease" in horses is now taking place. In June of this year, by following up, with the help of several enthusiastic veterinary practitioners in Forfarshire, Perthshire, Fife, and Kinross numerous cases of the disease, I succeeded in getting twelve live cases, which I could kill for investigation purposes. More distant veterinary surgeons also co-operated and collected material according to instructions from cases which they got permission to kill.

These cases have provided an immense mass of material to work upon and we have been wading through it by degrees for two months. Now we are in the position of having over a dozen good cases of the disease ready in boxes by the side of the microscope for the systematic recording of the pathological story, and this will be done by degrees during the next few months. Before next disease season the pathological changes as shown by the microscope in the various organs of the body will be known.

I have seen sufficient already to make me think we are really dealing with a pathological entity, that is to say, that the changes found in one horse's organs are the same, though varying in degree, in the other cases. This is an important point, as it points in all probability to a specific cause.

Much effort was expended in an endeavour to confirm the view of those who hold that the disease is equine botulism, but the results of this effort were to increase the conviction that that theory is incorrect. Horses appear to be peculiarly insusceptible to human botulism, much more so than I should have anticipated at a guess. The Loch Maree strain of the bacillus botulinus was used in the experiments. In one horse, following inoculation under the skin, symptoms of botulism developed and death resulted, but the symptoms were precisely those of human botulism, and in no way could they be confused with the symptoms of "grass disease." Hundreds of culture tubes were inoculated from the killed grass disease cases, and so far I have not been able to show that any growths which appeared in these tubes is the bacillus botulinus, though the Aberdeen investigators believe that they cultivated it from the spleen of every case. The question has been put to me, "If 'grass disease' is *not* botulism, what *can* it be?" The answer must wait, but the absence of an answer to this question does not prove "grass disease" to be botulism.

Sheep diseases I have left almost to the last, but they are by no means least. They afford some of the most serious problems in animal diseases.

Braxy causes serious losses, not only in the British Isles, but in various parts of the British Empire and in foreign countries. Scrapie is a serious matter in the border counties. Lamb dysentery is a veritable scourge in the south of Scotland and the north of England. Trembling usually follows the same distribution as braxy. Foot-rot is serious, so are mammitis in ewes, joint-ill in lambs and other troubles.

Most of you have heard of the successful work of investigation into braxy which has been carried out by the Research Association. The cause of the disease has now been settled beyond doubt, the method of infection has been shown, and the whole pathology of the disease has been clearly demonstrated as a result of the work of the last five years. What is important is that the work has been accepted by those in the scientific world who are capable of judging. We are now conducting field research into methods of prevention with considerable promise of success. A method of protective inoculation has been tried on a large scale, many thousands of hoggs having been inoculated, and it may be said, taking a wide view, that the method is without danger and gives immunity without affecting the condition of the hoggs.

It is inevitable in extensive field experiments of this kind that a few accidents result, but inoculation accidents with braxy vaccine this year total less than ·05 per cent.

If immunity holds through the severe test of a bad braxy winter, we have a valuable preventive remedy. I shall be satisfied if deaths are reduced in the inoculated to one-quarter of what they are in the uninoculated.

I shall deal more fully with braxy and other sheep diseases when showing the lantern slides.

The investigation of lamb dysentery has cleared up the nature of this disease completely. The cause and method of infection are fully known, and I believe it will be possible to prevent the losses from this disease by methods which the farmer must put into operation for himself. An account of this is being reserved for a special paper, which will be published in the near future.

This disease is a truly appalling calamity for the farmer wherever it appears. It has been in existence now for some years over large areas, and carries off every third lamb (about 35 per cent.) before the lambs are a fortnight old.

The disease is spreading, and has now spread outside the recognised area into the counties of Perth and Argyll.

Trembling and scrapie have so far baffled investi gators, but work is proceeding, and much organised investigation has been and is being done.

Mammitis in ewes and joint-ill in lambs are affections of which a good deal is now beginning to be known, and I am not without hope that the scientist can be, before long, of great help to the sheep farmer with these conditions.

Parasitic diseases are of great importance, and the Research Association is very greatly interested in them. Time will not allow me to treat here of the many problems in parasitology. It is a vast field for research, and is sure to yield useful practical results. When the Association gets its own field experiment station, with accommodation for all kinds of animals and facilities for work alongside the animals, as is shortly to be the case, attention is to be given to this subject.

I have outlined a vast programme for research into animal diseases in order to enable you to realise the extent of the need. What any one laboratory can undertake is only a very small portion of such a programme, but we select the most urgent and try our best to do sound and lasting work.

I want to ask you, as agriculturists, for your active co-operation, sympathy, and not least your financial support by becoming members of the Association. Try also and awaken the interest of the County Authorities in this work and get their financial help. Some counties have already come to our aid very substantially.

It is more particularly the diseases causing heavy annual mortality amongst all classes of farm animals which are the main concern of the A.D.R.A., not of course the highly contagious diseases which are dealt with by the Ministry of Agriculture, as, for example, foot-and-mouth disease, swine fever, etc., but the diseases which are unscheduled mainly because so little is known about them that no adequate measures can be framed against them.

Many of these diseases have been in the country probably as long as the stock. Some have the most astonishingly well-defined regional distribution and a very exact seasonal distribution, and they have had such serious effects that they even determine the methods of stock raising in the different districts. Some of them have been so long in existence that they have almost come to be looked upon as necessary; indeed not many months since, in discussing the results being obtained by vaccination against braxy, a reputable farming newspaper argued that lessening the danger from braxy would not altogether be advantageous, in that sheep would then be wintered in safety on the hill, but would in consequence be smaller than if wintered away, apparently having forgotten that the farmer selects the best of his breeding stock to keep, and braxy selects and destroys the best. The same writer expressed the view, apparently with regret, that the prevention of braxy would not result in an increase in the numbers of sheep in the country, implying, one would suppose, that we are better as we are, with braxy to keep down numbers. It has been truly said that hand in hand with research must go an improvement in education regarding such matters.

The first step in the investigation of a disease is to find out all the circumstances connected with outbreaks, and this is where the farmers can co-operate so usefully. There is less tendency amongst agriculturists nowadays to conceal losses, since it is becoming realised he needs the fullest information for his own guidance, and not to spread it abroad amongst his informant's neighbours. Given the information, the scientist can formulate plans for study. It is very rarely that the plans are alike for any two diseases except in a very general sense.

The medical research worker has his patients at hand in the great hospitals. In the same way the veterinary research worker must have ready access to diseased animals. He can either do this by taking equipment with him to a laboratory, temporarily established at the centre, where the disease exists, or he can bring the diseased animals to his permanent laboratory centre, where he must have facilities for keeping them, and isolating them if necessary. Some diseases are so quickly fatal that satisfactory preliminary investigation and collection of material can only be done at the centres where the diseases occur naturally. Other diseases are of a nature which allows of infected animals being conveyed to the case laboratory, where they can be kept under close observation, their symptoms watched, and pathological investigations made both during life and after death.

The satisfactory collection of material for investigation is essential. It is the sine qua non of success. More mistakes than one cares to enumerate have occurred from failure to realise this. Results based upon material collected from carcases found dead and commencing to putrefy cannot afford a true indication of what processes have been taking place when the animal first took ill or while at the height of the disease. The veterinary research worker has this inestimable advantage—that he can kill his patient to see what is going on in the body, and thereby gain knowledge for the benefit of the remaining animals.

The examination of material collected necessitates the greatest skill and care. The tissues and organs of the body may have to be subjected to special treatment and fine sections cut to show exactly what changes are occurring, which may not be discernible or intelligible to the naked eye. In some cases one may be able to concentrate upon such an examination of one or two organs only, where naked-eye changes are quite evident, but some diseases requiring investigation show no naked-eye changes in any part of the body, and one has to have the whole body prepared for microscopic examination. One has to have the whole horse or the whole sheep or other animal in a box, as it were, upon one's microscope bench, so that one can see what chapter in the story the microscope will reveal. There *is* a story for every disease, and it is that story which the research worker seeks to read.

When the pathological chapter is revealed, the pathologist has an important indication regarding the root cause of the disease. His training teaches him what the various microscopic changes signify, and then he sets to work from a new standpoint exploring the different avenues along which his already achieved results are pointing. These results are like a signpost met with on a journey with fingers pointing in several directions, and the next course is to explore the different routes, choosing first the one which intuition, based upon already-achieved results, indicates. Eventually one reaches a further destination, namely, the determination of the precise cause of the disease.

The determination of the cause of a disease is all important, but it is by no means the end of the story; it might be called, perhaps, the end of Book I. One sets out again, to show, from the knowledge gained what measures may be devised to prevent the disease or at least to minimise its ravages, and work of that nature is so extensive that it would fill Book II. in the story.

When the story of the disease is completed (if it ever can be called completed in these days of scientific advances), one goes back and revises portions of it to make it more perfect, and then it is published to the scientific world. To be called successful, the work must be confirmed and accepted by the scientific world, and if it does not receive confirmation and acceptance, it falls to pieces, though portions of it may be utilised for re-constructing something which will withstand criticism.

Whilst the plan I have indicated might be termed the normal in the investigation of baffling diseases, it is necessary to remember that important results have been achieved in some cases while the cause of the disease has still remained obscure. A notable illustration of this was Pasteur's method of preventing rabies or hydrophobia. By laboratory methods of experimentation, Pasteur showed how to prevent infection in persons and animals bitten by mad dogs, and this at a time when he did not know the actual cause of the disease. His methods, with modifications, are in use at the present day, although the precise nature of the causal agent of hydrophobia is still undetermined.

In the laboratory of the Animal Diseases Research Association we have a number of diseases under investigation, and a very great deal of information has been collected and knowledge built up regarding them.

Before illustrating on the screen the story of the braxy and other investigations, I want to show you a few slides as examples of the various causes of disease. The causes lie in various very large groups, as for example :—

(1) Animal parasites. These are mostly easily visible to the naked eye. The study of these is termed Parasitology.

(2) Microscopic animal parasites called Protozoa, the study of which is termed Protozoology.

(3) The bacteria, which are the lowliest and simplest living forms common to the animal and vegetable kingdom, and whose study is termed Bacteriology.

(4) What are called the Filterable or Ultravisible viruses, that is to say, forms of life which are too small to be seen by the most powerful of present-day microscopes, some of them so small they would almost seem to be in solution, an example being the virus of foot-and-mouth disease.

The study of all these causal agents which I have enumerated is known as the science of Pathology.

Other slides shown were in connection with braxy, lamb dysentery, and scrapie in sheep, grass disease in horses, and tuberculosis in cattle.

The braxy slides illustrated the naked-eye appearance of the lesion in the fourth stomach, sections through the thickness of the stomach wall, as seen under the microscope, showing colonies of the invading bacilli being attacked by the white corpuscles from the blood, and also showing them forming spores in the wall of the bowel. The braxy bacillus was also shown in culture liquid and in comparison with the black quarter bacillus. It was next seen specially stained, to show the presence of flagella, which cause movement and compared with the typhoid bacillus in this respect. The method of making the toxin for inoculation was then illustrated.

Some interesting slides showing tuberculous cattle and the method of making tuberculin were shown.

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Cheques should be made payable and all communications sent to the General Secretary at the Offices of the Association, 10 Gray's Inn Square, London, W.C.1.

STATE SERVICE AND SALARIES.

We have refrained from writing on this subject for some considerable time, not because the claims and needs of our members remain unnoticed, but rather because information has been in process of being collected and considered by a Committee of this Association appointed for that purpose. Quite apart, however, from letters and documents which have been sent to that Committee, there is an abundance of evidence in our daily correspondence which shows unmistakably the feeling of discontent throughout the profession with the terms of service which are imposed upon those of our members who hold State appointments. We have inquired into some of these complaints, and we are satisfied that there are injustices which have to be tolerated which would not be borne by a private individual who is a free agent. It must be remembered that a State servant or Civil servant cannot express his grievances in the press ; he must communicate all he has to say through the proper channels, and he is eventually left entirely in the hands of the head of his department. The head of the department may or may not be sympathetic, and too often he is impotent, or at least unwilling, to exert himself on behalf of his staff. Many of us in civil life do not understand, and therefore cannot realise, the unhappy position of these men, and how of necessity they must be inarticulate. The only way in which they can be helped is by the united action of their professional brothers, and it is here that this Association has come forward pledged to do its utmost in their behalf. But the Association must have the unanimous and sincere support of the whole of the profession in any steps which it may see fit to take, if its efforts are to be effectual. There are members of our profession living in far-off lands where the conditions of service are very trying and vexatious, where they are subservient to other professions and interests, and where there is no State veterinary service. In these cases, applications, complaints, and other requests have to pass through unsympathetic and often unheeding channels. It

may be asked—Why do men accept such posts? We know that the answer only too frequently lies in ignorance of the terms of service, or in economic necessity. From a large correspondence with overseas men, we can come to no other conclusion than that the basis of most of the low salaries paid and the poor conditions of service is to be found at home, and that before these Colonial positions can be improved we must set our own home service in order. From every district in this country, from India and from Africa, we receive continual complaints as to the miserable pay and vexatious conditions of service in the Ministry of Agriculture which, instead of making its service the premier service in the State, has come to be regarded, as far as veterinary appointments are concerned, as a disgrace to a great country whose chief asset is agriculture and the breeding of stock. Service in the Ministry of Health (and in some of the larger municipalities) is far superior, and we welcome the more sympathetic treatment which our members receive from this department. Its importance to our profession is daily increasing, and in time, when veterinary science takes its proper place in public life, it will find employment for a large number of veterinary surgeons under conditions vastly superior to those in the present Ministry of Agriculture. The fact that the latter, under the stress of an epidemic, has been compelled to offer temporary veterinary surgeons (even newly-qualified men) terms which exceed in value the pay of a Divisional Inspector on the establishment goes a long way towards proving that either the latter is woefully underpaid or that the former is being treated too generously.

We hope that the Committee now sitting will earnestly consider the service of the Ministry of Agriculture and make some recommendations which will be acted upon by our Association, so that the conditions may be ameliorated and the stigma removed from what should be the finest and best paid service in the country.

The Tuberculosis Order, 1914.

In the House of Commons, on February 19th, Sir Henry Webb asked the Minister of Health whether he had reconsidered the decision of his predecessor as to the revival of the Tuberculosis Order of 1914; and, if so, when the order would be put into operation.—Mr. Buxton (Minister of Agriculture) replied: I may explain that the question as to whether it is practicable to put into operation at the present time the Tuberculosis Order of 1914 is now under consideration. I hope to be able to come to a decision in the matter at an early date.

Clinical and Case Reports.

The Editor will be glad to receive from members and others contributions to this column of reports of interesting cases.

The Etiology of Milk Fever in Cows.

By J. Donaldson Pottie, M.R.C.V.S., Greenock.

Reading with great interest Mr. F. T. Harvey's article on Dr. Schmidt and his Treatment for Milk Fever," in the *Veterinary Record* of February 2nd, 1924, I consider that this article is of more than passing interest. It is, at least, worthy of close attention by all members of the Veterinary profession engaged in cattle practice. The article, in my opinion, strikes at the root of the cause of milk fever in cows, namely, metabolic blood pressure.

In common with many other observers, I have studied this disease carefully for many years and had the valuable opinions of many veterinary surgeons engaged in cattle practice, including that of the late Principal Walley and my late father, Alexander Pottie, Senior of Paisley, and their opinions were that the disorder was a kind of "stomach staggers" at, or near calving. I gave it as my opinion, however, that it was a disease which might be termed "udder staggers," due to some (sudden) pressure on the udder firstly, and then on the brain; perhaps in some cases to slower, but continuous pressure on the udder, causing partial paralysis of that organ and reflex brain pressure. Thus a close connection exists between "stomach staggers" (either sudden or slow in nature), this being pressure on the stomach or stomachs of cattle primarily, and secondly, in the brain and nerve centres, and "udder staggers" (hyperæmia of the udder) which primarily affects the udder or mammary gland and secondarily the brain and nerve centres. "Milk fever" should, therefore, be termed "mammary hyperæmia," or later in on the disease, "mammary toxæmia," due to carbonic acid poisoning and other material, from want of proper oxidation. Hence, in both "stomach staggers" and "milk fever" we get the excitement stage, usually followed by coma and paralysis. In cases I have seen of both "milk fever" and "stomach staggers," on *post mortem* examination I have found actual hæmorrhage in the brain, or apoplexy. "Stomach staggers" begins in the stomach, and if not relieved, passes on to the brain. "Milk fever" begins in the udder and also passes on to the brain and nerve centres. The cause in both cases is not far to seek. Both stomachs and udder are well supplied with blood and nerves, and any great derangement in their circulation is bound to affect the circulation of brain and nerve centres. The vital difference between milk fever and stomach staggers is that a cow with "milk fever" will be chewing her cud and go down within half an hour, whereas in a cow with "stomach staggers," rumination is suspended for hours or days before she falls down; except where her food is of extra strong quality and acts as a direct irritant to the mucous coat of the stomach—in fact, a poison. She may go down in an hour or two from acute gastritis or abomasitis.

(*To be continued*).

An Unusual Accident to a Boar.

By Frank Chambers, F.R.C.V.S., Wolverhampton.

A few weeks ago I was called in to see a twelve months old pedigree middle white boar that had been "hiked" by a cow. The boar was feeding in a field close to the farm buildings when the cows were being brought up for milking. One of the latter was seen to run at the boar. I found that the horn had penetrated the anus, causing a small wound about half an inch in length. Hanging down from the anus was a "cord" some eight inches in length with a blood clot adhering to the end. The boar resented extremely the handling of the projection, which on further examination proved to be the penis. I had the poor animal destroyed and verified my diagnosis at the abattoir. The penis was torn off some three inches from the free end. Evidently the cow's horn had entered the anus, and being sharp, had hooked itself under the penis where it passes over the brim of the pelvis, and pulled out the portion that was hanging.

Ruptured Intestine in a Bitch.

By W. R. Davis, M.R.C.V.S., Enfield.

The readers of the *Record* are being constantly appealed to for descriptions of clinical cases; perhaps, therefore, you will allow me to amplify the report of one which appeared in your last issue.

On Sunday, February 3rd, a Cairn terrier bitch rushed at a passing motor car, going between the front wheels and reappearing between the hind ones. The bitch was picked up and examined. There was no wound, and the animal did not appear to be suffering in any way. She took her evening meal. On the following day (Monday) she was taken out with two other little dogs, with which she played and hunted in the woods. At night she refused her food. On Tuesday the bitch was ill and was given a dose of castor oil, which she soon vomited. I was sent for and attended in the afternoon.

The patient had a rapid pulse, the abdomen was distended, and slight pressure on it was followed by shrinking and groaning or complaining. The bitch was sleepy, as if under the influence of a narcotic. Gastric trouble was suspected and mild stomachics were given with a stimulant. The bitch died at night (Tuesday night). On making a *post-mortem* on Wednesday, bloody fluid was found in the abdominal cavity. There was extensive peritonitis, and the intestine was ruptured. At the seat of the rupture considerable hæmorrhage had taken place, thickening the intestinal wall. No wound or other injury to the abdominal wall could be found. It seems extraordinary that for twenty-four hours after the accident the patient gave no evidence of being injured internally.

Abstracts and Reviews.

The Endocrine Glands.

The following is an abstract, reprinted from *The Chemist and Druggist*, of the report of a lecture on the above subject, by Dr. Leonard Williams, delivered at a recent joint meeting of the Western Pharmacists' Association and the National Association of Women Pharmacists.

"Addison, in 1860, discovered the suprarenal gland, but failed to seize the idea of its secretory function. Sir William Gull and others gradually unravelled the mystery of the thyroid gland, thus opening up a new field in which came the pituitary, pineal and thymus glands. The pancreas was shown to be provided, in addition to its external secretion, with an internal secretion passing directly into the blood-vessels. The endocrine glands constitute a hierarchy: the illness or absence of one reflects its influence on the whole system. If we take Shakespeare's seven ages of man as a division of human life, there is little difficulty in selecting the gland or glands responsible for each period. They defend the body against toxic invasion, and, in addition to protecting us from hordes of germs, guard us from the more dangerous poisons that we ourselves produce. They are in the closest connection with the central nervous system, upon which we depend for the intellectual life. Energy must be focussed on the nervous system: something is required to retard skeletal and visceral growth, as, otherwise, maturity is reached too quickly. In the first age of man, infancy, the thymus and pineal glands retard. Disease of the pineal gland may involve premature sexual development. The thymus gland is an enormous gland in infancy, reaching its minimum at the age of puberty, but never entirely disappearing. The thyroid gland comprises four smaller glands (parathyroid glands) with functions distinct from those of the thyroid proper. It is concerned in the utilisation of iodine and the metabolism of calcium salts. Calcium is the bread of our physiological life: rickets form the best example of improperly used calcium salts. In the second age of man, that of the schoolboy, the interstitial gland assumes the lead, and enters into diplomatic relations with those already established. The pituitary gland takes on great importance. Giants represent over-active pituitary: all true giants die of tuberculosis. There are minor degrees both of deficiency and excess: no man is entirely male, no woman entirely female. Shakespeare's lover need not detain us: his sighing and woeful ballads denote the absence of gland qualities conspicuous in the soldier, in whom the glands have attained to a certain equilibrium. Fight, fright and flight are questions of endocrine pattern—*i.e.*, of temperament. Shakespeare's remaining ages represent degenerate changes. The proportions in which hormones are mixed in the blood at birth may vary—*e.g.*, in the case of four brothers, all of whom may be normal.

Environment is of obvious influence. Education is a process partly of organised, but largely of fortuitous, suggestion. Psychologists often fail to realise that lack of adaptation to environment is chiefly of endocrine origin. Cooking is as great a departure from evolutionary normality as the distillation of alcoholic drinks. Vitamins, which may be described as exogenous hormones, are present, broadly speaking, in uncooked and absent from cooked foods."

The Grey Parrot.

We have been reading a little handbook on this favourite bird by Dr. Greene, whose popular works on birds are so well known, and we think the Veterinary Profession will be interested in it. Members of our profession are frequently called upon to treat the parrot when ill, and it is useful to have at hand a book which contains much valuable information about the ailments from which these birds suffer. The diseases of parrots are dealt with by Mr. Henry Gray, M.R.C.V.S., in the final chapter, and this gentleman has included in it a brief but excellent article on tuberculosis, in which he points out that the parrot is subject to both human and bovine tubercle infection as well as the avian type. This article alone makes the book a desirable addition to the veterinarian's library.

[THE GREY PARROT AND HOW TO TREAT IT, by W. T. Greene, M.A., M.D., and Henry Gray, M.R.C.V.S. London Bazaar Exchange and Mart Office, 54 Drury Lane, W.C.2, 64 pp., paper. Price 1s. 6d.]

EDINBURGH GRADUATE'S TRAGIC DEATH IN MISSOURI.

Mr. E. H. Stent, of Manchester, forwards us information concerning the untimely death of Mr. James Hart, M.R.C.V.S., a graduate of the Edinburgh College. Mr. Hart, who had formerly practised in Nebraska, Iowa, and several other States, as well as being employed by the British Government, and stationed at Lathrop, Missouri, during the war, entered the service of the Missouri State Penitentiary approximately two and a half years ago.

On the night of February 4th, 1924, he was attacked by three desperate convicts, who had sawed their way out of their cell, and brutally murdered.

In sending a communication on the tragedy to the American Press, Mr. H. A. Wilson, State Veterinarian of Missouri, pays tribute to the high estimation in which Mr. Hart was held by all who knew him.

In reference to the statement in the course of Mr. Barker's reply to the discussion on "Canker Treatment," in our report in the issue of February 9th, that "I should have said that the period (of cure) of three weeks given refers to case where the foreleg only is affected," Mr. Barker writes to point out that if the word "frog" is substituted for "foreleg" it will convey the correct meaning.

Devon Diseases of Animals Committee is calling a conference of the county authorities of Cornwall, Somerset, Dorset and Wilts to review the foot-and-mouth disease regulations in the five counties.

Divisional Reports.

Central Division.

MR. H. GRAY'S REPLY TO DISCUSSION ON "RICKETS."

Mr. H. GRAY: First of all, I must thank you all for the splendid way in which you have received my paper, and, more especially, Professor MacQueen and Dr. Rowlands. I think Dr. Rowlands, being a medical man and a livestock owner, made the discussion more refreshing.

Professor Wooldridge brought forward the question of the influence of ultra-violet rays, and the part they play in the treatment of rickets. I do not know if these rays are used in conjunction with an improved dietary or if they are used alone. If they are used alone, what becomes of the vitamine theory? But if not, it seems to me to be difficult to arrive at its relative value or if it has any value at all. We know that cattle affected with ringworm turned out to graze in the springtime lose that disease. Is its disappearance due to the sun's rays, or to the grass, or to both?

Veterinary surgeons have, however, always practised helio-therapy and vitamin-therapy by turning their animals out to graze when unthrifty, sick or lame. Agriculturists and other stock-breeders have always known the value of free exercise, green grass and sunlight for their young animals. They have always looked upon animals born in the autumn and earlier winter months as not likely to do so well as those born after Christmas, when Spring was advancing. This is, so far as my knowledge goes, traditional knowledge. As to *la maladie du reniflement*, *schnufelkrankheit*, or snuffles, the majority of Continental authorities look upon it as rickets. Although the head is enlarged, all the bones of the skeleton are affected, This enlargement and softening of bones of the head is rare in rickets but common in osteomalacia of the adult dog. Phosphate of lime was generally abundant in the urine of rickety animals; but in some cases this was normal, especially when the phosphates were being passed with the fæces.

In Moussu's experiments the marrow taken from the long bones of pigs suffering from the acute or early stage of osteomalacia was infective. Liénaux and many other observers look upon osteomalacia as an infective disease, but the majority deny that it has any quality of infectivity. Although nearly every authority asserts that osteomalacia is due to lack of phosphate of lime in the food, there are some who state that this is not deficient. In Robertson's experience the disease occurred on lands that had been recently limed. But why should this disease attack asses and leave horses, mules and cattle indemnified? Again, why should it be seen in imported animals and not in the indigenous animals? Why should it on the Continent attack English breeds of pigs and their crosses bred and reared there more than the indigenous

breeds if it *is* due to lack of phosphate of lime in the soil or fodder? Why should it occur in some seasons and not in others? Morgan found in the Argentine the disease in young donkeys, many of them being only a few months old. It attacked about 20 per cent. It did not occur in the cattle, horses and sheep. It could not be put down to lack of exercise, lack of sunlight or fresh air, or to bad housing or dampness. He was inclined to attribute it to an unbalanced dietary or to lack of vitamines. But if it were due to an unbalanced ration or to lack of vitamines why should it attack the ass and not the other species? (*Vet. Journal*, 1923, Nov., pp. 404-5.) In Tonkin osteomalacia attacked asses of 7-12 years of age but not the older ones. It seems to me, from these facts, that we know very little, if anything, about the cause of rickets or osteomalacia, and in consequence there is a great opening for further research.

It is quite possible that crude or unrefined cod liver oil contains chemical elements that have a beneficial influence on the system in rickets, osteomalacia and other nutritional diseases, and acts similarly to potassium iodide in actinomycosis and other fungal diseases. It contains iodine, bromine and phosphorus in an organic state. It also contains a great number of alkaloids of which butylamine, amylamine and more especially morrhuine and morrhuic acid are the principal.

We all welcome the presence of Dr. J. M. Rowlands, a member of the sister profession, who is not only a pathologist and a practitioner of human medicine, but also an extensive stock-raiser, and therefore his remarks on this question should be invaluable. The more angles from which we view this disease the better will it be for science and practice. I quite agree with his remarks about unrefined cod liver oil, as they coincide with the teaching we obtained 40 years ago. In fact, I believe it has been the teaching in existence long before any of us in this room were born. Nevertheless, the facts he mentioned are likely to be overlooked by the newer generations, who are more eager for the plums of knowledge without caring for the fabric by which they are encased. As to the oils of vegetable seeds I cannot quite accept his view. What may not be vitamines for the omnivora (pig and man) and the carnivora may be for the herbivora. It seems to me that vegetable oils like linseed oil are more nourishing to the herbivora and granivora. We can only look upon cod liver oil as a medicine in disease; it is not a natural food for any of our domestic animals. As to tuberculosis being a nutritional disease, I think that is a dangerous view to take. It is no more a nutritional disease than is malaria or glanders. If we get rid of the infection there will be no disease.

The reason why cows are very liable to tuberculosis is the fact that the conditions under which they are kept are favourable to its contraction. Even when they are never housed, as in Australia, they get the disease. Horses kept with cows are liable to develop the disease: it is the same with sheep and goats. Sheep are not immune to infection, and yet it is not seen in one out of 500,000 or 1,000,000. It is because the life they lead is unfavourable for its contraction. Take the disease to a new country or people and it spreads as an acute infection as it is spreading in Finland and Lapland. The people of Davos Platz or St. Moritz were not attacked until our consumptives went there. Monkeys frequently have it in a pyæmic form when they land in this country. Parrots fed on cow's milk or belonging to consumptives frequently have the malady. It is not so much the nutrition as the environment. Pigs rarely have tuberculosis unless they are given tubercular offal or the clearings of a separator. If man did not crowd together there would be less chance of infection. We who are resistant exemplify the law of the survival of the fittest in the same manner as do the natives living in a malarial district. It may be true that the physiology of immunity is that of nutrition, but, I fancy, however well we may nourish a tubercular-free community, it would not prevent them contracting the disease should they get infected. Farmers know the manurial value of fæces of animals fed on oil and other cakes and so do market gardeners that of town-fed horses. The Chinese know the value of human manure; we shoot it into the sea to feed fishes and perhaps to get back typhoid and to impoverish our top soil. Still, we do get back something to feed our bodies, and our animals and plants.

I purposely avoided the morbid anatomy and histology and the radiological character of the disease, as it would have made my paper too long and they were well known to the audience.

I cannot quite understand why a man of Dr. Rowlands' knowledge should have had rickets in his pigs at all. I have known estates on which more than 1,000 large black pigs were kept without rickets ever occurring among the herds. But they were fed on the produce of those estates. Evidently Dr. Rowlands was not in possession of that knowledge gained from experience of the past. If the vitamine theory is sound I do not see why he should have had rickets in the 11 four months' old pigs of a sow, said to have been fed on a deficiency diet during pregnancy. The vitamine foods and crude cod liver oil given to the sow after parturition and the 11 young pigs after weaning should have compensated for the evil effects on the fœtuses during pregnancy. Evidently the vitamine-lacking theory was at fault. Dr. Rowlands cannot turn it about to suit every case in which vitamine-feeding fails to prevent the disease.

In reply to Mr. Kirk, I agree that the glandular system may have something to do with rickets inasmuch as, if it has to cope with material to which it has not been used, it cannot fulfil its function in nutrition well. I cannot accept his statement that rickets only occurs in isolated individuals. In animals submitted to the same conditions in a certain place the majority may be attacked at the same time as in dogs, pigs and donkeys. There may be something in his theory, but at present it is more academic than practical. I never said that 90 per

cent. of distempered dogs had rickets; what I did say was that 90 per cent. of my cases of rickets occurred in dogs suffering from distemper. We must not assume because we give a so-called remedial agent in disease, that recovery was brought about by that agent. Experience of past ages has shown us that there are very few specific agents, like thyroid in myxœdema and cretinism, iodide of potassium in actinomycosis, or air in parturient apoplexy or coma. *Vis medicatrix naturæ* is a very reliable system in the majority of maladies. Hence the multitude of quack or empirical medicines. The object of science is to overcome this empiricism and to enable us to use remedies with more or less mathematical precision.

Nevertheless, I hope Mr. Kirk will go deeply into this question with the idea of elaborating some better method than is now in vogue for combating the disease. Dr. Rowlands' practice of preventing it is better than endeavouring to cure it.

Professor MacQueen says that he has only seen rickets in the dog and pig. He has overlooked the fact that the goat is an animal very subject to this disease—more so, perhaps, even than the dog. If you do not give them exercise they will go rickety, no matter what food you give them. He also said he has not seen it in foals. I have had occasion to see it in foals, bought by little people for a few shillings. These people have tried to rear them on food unsuitable for their age—on green food and without milk, and they have kept them closely confined.

As to distemper, probably a lot of Professor Mellanby's dogs were affected with distemper; in fact, he said that a dog affected with distemper was more subject to rickets and, in consequence of that, he always destroyed them at the first sign of it. I think that answers Professor MacQueen's contention. Ninety per cent. of my cases of rickets have been in dogs with distemper. Why? Because they were usually confined. Feed them on whatever you like they will go rickety and their bones will curve and even break if you keep them closely confined for several weeks.

There is no difficulty in distinguishing osteo-periostitis in the dog from rickets. Osteo-periostitis, as a rule, occurs in the adult animal; there is a difference in the condition of the bones—there is very little, if any, liability to curvature.

Dr. Rowlands made mention of anæsthesia. Most of you know that we have to be more careful with a puppy than with aged dogs; in fact, it is often difficult to kill aged dogs with chloroform.

There is no doubt that heredity does play a great part in the disease. In the majority of dogs the fontanelles are closed entirely before they are a month old; at any rate, I do not think you will find in any number, with the exception of the short-faced dogs, any trace of the fontanelles at two months. I think osteomalacia and rickets are the same, because one may see rickets in pigs at six weeks and cattle of two years with osteomalacia on the same premises. I am not going to accept Professor Mellanby's theory

(*Continued at foot of next column.*)

Notes and News.

The Editor will be glad to receive items of professional interest in these columns

Diary of Events.

March 14th—Meeting of the North Wales Division at Llangefni.

To-day the veterinary profession celebrates its eightieth birthday, our first charter having been granted on March 8th, 1844.

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We should be greatly obliged if any gentleman willing to take one or more pupils during the Easter vacation would communicate with this office at an early date. We have several students anxious to get practical experience on our books, and many of them are quite ready to pay a reasonable fee for the privilege. We have several qualified men also who are very anxious to get positions, and we would like to be able to give them some help and encouragement. Unemployment to the recently qualified man is most disheartening.

(*Continued from previous column.*)

as the absolute cause of rickets or other nutritional diseases. When you see animals fed on all the vitamine-containing foods and develop that condition (photograph shown) it is plain that rickets has a lot to do with the way in which animals are brought up. What may be good for one race may not be good for another—the diet must be native to the locality and climate if it is to be the best for the animal.

I remember Mr. Banham taking me some years ago to a farm in Cambridgeshire on which all the yearling colts had enlarged epiphyses of the bones. He told me that there had been an outbreak of navel-ill. I think that accounts for a good deal of what Professor MacQueen says about enlarged joints in young colts. In rickets, moreover, there is a curvature of bone, and, while in the majority of cases of rickets there is not much bone, in osteo-periostitis there is a great deal of bone, which becomes enlarged. One would expect rickets to show its effects more in the centres of ossification, especially in the cartilage that attacked the ossifying centres to the shaft.

Most of the speakers had by then answered and filled up many of the points omitted in the paper and therefore there was very little left for me to reply to.

The PRESIDENT: I should like to propose a very hearty vote of thanks to all those who have brought *post-mortem* specimens, and to Mr. Gray for his paper. I am sure that Mr. Gray is well rewarded for the time he spent upon it by the splendid discussion it has produced.

The vote was warmly accorded and the meeting concluded with thanks to the President for his conduct of the meeting.

J. F. MACDONALD, *Hon. Secretary.*

Mr. Chas. Hill presided at the meeting and dinner of the North of England Division last week at Darlington, when there was a good attendance of members, though not so many as had been expected. Many were ill with influenza, and the weather was bitterly cold and stormy, so it is hardly to be wondered that these gentlemen preferred to stay at home. Lt.-Col. Reid gave a really excellent address on foot-and-mouth disease, and later in the evening the first-hand information and knowledge he brought of conditions in Australia and New Zealand were most interesting. Our ubiquitous President, Mr. H. J. Dawes, was, as usual, present, and received a very cordial reception, which he rightly deserves, for the untiring work he does for the Association.

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Two original members of the Society were present also, and were able to relate some interesting reminiscences, namely, Mr. George R. Dudgeon, of Sunderland, and Mr. Percival Snaith, of Bishop Auckland. The society has traditions to live up to, and in the past has been one of the most alert and active societies in the country. It is to be regretted that the profession has heard so little of its doings, no account of any meeting having appeared in the *Record* for a long time. The proceedings are, however, published shortly in the local press.

Foot-and-Mouth Disease Research Committee.

The Minister of Agriculture (Mr. Noel Buxton), speaking on a vote of £2,958,000 for salaries and expenses of the Ministry when the House of Commons went into Committee of Supply on Thursday, February 28th, said that he was glad to be able to announce that the names of the members of the Committee of Research, which, as he had stated the previous week, had been set up, were :—

Sir Charles Sherrington, President of the Royal Society (chairman) ; Dr. J. A. Arkwright, of the Lister Institute of Preventive Medicine ; Dr. W. Bulloch, F.R.S., Professor of Bacteriology, University of London ; Professor J. B. Buxton, Director, Institute for Research in Animal Pathology, Cambridge ; Captain S. R. Douglas F.R.S., Director of the Bacteriology Department, National Institute for Medical Research ; Mr. S. H. Gaiger, F.R.C.V.S., Animals Diseases Research Association, Glasgow ; Sir John M'Fadyean, Principal and Professor of Comparative Pathology, Royal Veterinary College ; Professor C. J. Martin, F.R.S., Director of the Lister Institute of Preventive Medicine ; Professor Robert Muir, F.R.S., Professor of Pathology, University of Glasgow ; Sir Stewart Stockman, Chief Veterinary Officer, Ministry of Agriculture ; Mr. H. G. Richardson and Mr. W. G. Wragg, Ministry of Agriculture, secretaries.

The terms of reference were :—" To initiate, direct and conduct investigations into foot-and-mouth disease, either in this country or elsewhere, with the view of discovering means whereby the invasion of the disease may be rendered less harmful to agriculture."

Mr. Fisher feared that the terms of reference of the Committee to investigate foot-and-mouth disease would prevent their considering the source of infection, and the ratio between the number of veterinary experts and the live stock in this country. Great Britain, which led the world as a producer and breeder of stock, was far behind other countries in the matter of the supply of veterinary surgeons.

Mr. Buxton, replying to points raised, said he would carefully note the suggestion that the terms of reference to the Foot-and-Mouth Disease Research Committee should include the question of the sources of infection, and he had also noted the point as to the ratio of veterinary officers in this country.

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The Marquess of Titchfield asked the Minister of Agriculture if he would state why the embargo on Irish cattle had been removed ; and whether, owing to the increase of foot-and-mouth disease in the Midland counties, the embargo would again be enforced.

Mr. Buxton, in a written reply, states :—The embargo on Irish cattle was removed because, as a result of inquiries into the origin of the outbreak of foot-and-mouth disease at Nottingham, the Ministry was satisfied that infection was picked up at Nottingham Station, and did not originate in Ireland. With regard to the last part of the question I may explain that, although the trade in Irish cattle has now been resumed, the normal restrictions on the movement of such cattle apply. On landing Irish cattle are required to be detained at least ten hours at the landing place, and are subjected to a veterinary examination by inspectors of the Ministry, and they are then licensed either direct to a slaughter-house, or to farm premises, where they are required to be detained for 28 days. None can be distributed direct from the ports through a market. I am advised that there is no ground for reintroducing the embargo on Irish cattle.

In reply to Sir Clive Morrison-Bell, Mr. Buxton states that the Ministry of Agriculture has carefully considered the possibility of organising international action against foot-and-mouth disease. The point was raised at the initial meeting of the International Bureau, which sits in Paris under the patronage of the French Government for dealing with animal diseases in general, and the idea was sympathetically received, but it was felt that it would be impracticable to attempt eradication while the disease was widespread on the continent. Mr. Buxton adds that the terms of reference to the recently-appointed research committee empowers it to collaborate with research organisations in other countries.

Army Veterinary Service.

London Gazette. War Office. Regular Army Reserve of Officers.

Lt.-Col. A. England having attained the age limit of liability to recall, ceases to belong to the Reserve of Officers. (March 1st.)

Territorial Army.

Major J. A. Connell, F.R.C.V.S., T.D., is appointed D.A.D.V.S. of a Division (January 19th) ; Captain J. Bell, F.R.C.V.S., having attained the age limit, is retired (March 1st), and retains rank of Captain.

Correspondence.

Letters to the Editor should reach the Office not later than by the first post on Tuesday morning for insertion in following Saturday's issue.

All correspondence must bear the name and address of the contributor for publication

The Editor does not hold himself responsible for the opinions of his correspondents.

The Animals' War Memorial.

To the Editor of The Veterinary Record.

Sir,—I enclose a cutting with the above heading from *Truth*. Further comment is unnecessary.—Yours faithfully Graham Rees-Mogg.

February 16th, 1924.

"People who can desire and subscribe to erect a £2,000 memorial to the birds, beasts and fishes who fell in the war are not likely to be diverted from their folly by argument or ridicule. Captain Fairholme's communication to the press on the subject sufficiently shows that. The last hope of the nation in these circumstances is with any public authority which has the power to veto the proposal. As 'Hyde Park Corner' is described as the site selected for this monument of imbecility, the necessary power seems to rest with the Office of Works or the Westminster Borough Council, and in view of the chorus of protest from every quarter, to exercise the power becomes a duty. The proposal is really an outrage. It is a *reductio ad absurdum* of all the war memorials in the country from the Whitehall Cenotaph downwards, and a thing to make us look fools in the eyes of rational mankind at large.

"The secretary of the R.S.P.C.A. says, 'We were asked to raise the money for a special purpose, and we have no right to divert it to any other.' Then the best thing they can do is to send it all back. Evidently it has not occurred to the managers of the R.S.P.C.A. that the society itself and the cause it represents stand to suffer heavily if they persist in defying public opinion."

Beet Poisoning.

To the Editor of The Veterinary Record.

Sir,—I was much interested in reading the accounts given of beet poisoning in pigs and cattle by Mr. Harry Low. It is to such things as these that we should direct our attention in days of declining horse practice and bad times for the general and country practitioner. What is the cause of death in beet poisoning? Is it associated with an excessive supply of the roots, or is it due to the way they are given? Are roots best given raw or cooked? Most feeders recognise that they ought not to be given at all until they are ripe or what is known as "clung." Most of us have seen cases of potato poisoning attributed to the alkaloid *solanin*; some of us have recognised that sudden deaths may arise in horses from excessive feeding on carrots due to an alkaloid called *carotine*, and in which cases there seem to be no marked *post-mortem* symptoms, because there is little doubt that the horse dies of pure syncope. I am inclined to think that deaths in cattle and swine fed on *good* swedes are due also to syncope. Altered and badly-preserved roots, on the other hand, may cause death from intoxication by microbian toxins contained in the food. The *post-mortem* lesions one finds in these cases are those of enteritis and congestion of the kidneys, or gastro-enteritis and congestion of the coverings of the brain.

There is no doubt that an excessive supply of roots given to pigs and cattle causes not a few deaths. Are roots more safely given raw than cooked to pigs? I think there is much to be said, in the case of beet, for giving them raw and mixed with meal, and, from several *post-mortems* I have made on swine, I do not think they ought to be given to pigs under three months of age (the same applies to potatoes), and at any age they should not exceed one-fourth part by weight of the solid portion of the diet. The arguments in favour of giving roots raw rather than cooked are that by cooking tastiness is diminished and the albuminous constituents of the food become more difficult of digsetion, the sugar in the roots is boiled out, and, unless the water in which the roots are boiled is given with them, this ingredient is lost. The ferments in the roots which aid digestion are destroyed by boiling. An exception should be made in the case of sugar beet, which, on account of its richness in salts, is injurious when given in the raw state. Roots should be pulped both for cattle and swine. Potatoes are, of course, best cooked and given with meal, but here again the rules as to age and quantity and mixture with meal ought to be observed. Many deaths in swine result from excessive and too early potato feeding. I think that it is quite probable that the 27 store pigs that Mr. Low found dead died of syncope from weak hearts and indigestion. In horses fed with too many carrots one sees progressive muscular weakness, patchy sweating on slight exertion, and finally syncope and sudden and apparently painless death.—Yours truly, G. Mayall.

Bolton.

Canker Treatment.

To the Editor of The Veterinary Record.

Sir,—About the year 1899, my father (the late H. Buckingham) persuaded an old man by the name of Goss to come over and try to cure a case of canker. Goss was over 80 years old, and for many years had earned a good living by treating flocks of sheep for foot rot, etc., and there seems to be no doubt that he could and *did* cure canker. It "took a lot of doing" to get him over and to divulge his secret, but somehow it was done.

Goss's treatment was exactly what is now being done by canker experts, viz., paring, applications and pressure, dryness, plenty of time, patience and hard work, with, one fears, very little comparative pay. I have never seen the applications that Goss used quoted. Having pared and prepared the foot, then carefully greased the coronet and fastened old sacking round it, he poured turpentine on the diseased parts, immediately followed by strong sulphuric acid, for wherever the turpentine went, the acid was sure to follow. Of course these applications should not be allowed to encroach on the coronary band. The effect was to secure a beautifully clean, white surface in a few hours.

I wondered if any canker expert had tried it; if not, I strongly advise him to do so. This treatment is, if necessary, repeated in about a week's time and for as long as required. In the meantime dressings with mutton fat and Stockholm tar, equal parts, and pressure with as much dryness as possible, leather boot, etc., were used. My father tried to induce me to take it up, but I found life too short, pay too small, and that I could occupy my time more profitably.

Needless to say, the dressing is dangerous, so that one needs be careful of fingers, face and floor. I believe it would ignite any material that would burn. I remember my father trying to mix the two in a 2oz. glass measure, in the surgery; there was a big explosion, smell, etc., and he did not do it again.

I wish to conclude by mentioning the following facts in connection with a ten-year-old Yorkshire terrier bitch. This is a maiden bitch. Twice a year her glands swell up and she gives a supply of milk just as if she had had a litter of pups. She has to be milked, as if this is not done she suffers pain. Can you or any of your readers tell me how to stop the secretion of milk? I would be grateful for the information.—Yours truly, H. Buckingham.

Earlham Road, Norwich,
February 26th, 1924.

The Editor begs to acknowledge the receipt of the following :—

Communications from Lt.-Col. H. A. Reid and Messrs. H. C. Ganguly, A. W. Holtum, A. S. Leese, W. Litt, R. Painé, W. Scott and V. V. Venkatachala.

Report of joint meeting of the Scottish Metropolitan and West of Scotland Divisions from Mr. H. Begg, Hon. Secretary.